DOCUMENT RESUME

ED 317 443 SO 020 507

TITLE	Science and Technology for Development. Report of the United Nations Issues Conference (19th, Harriman, New York, February 26-28, 1988).
INSTITUTION	Stanley Foundation, Muscatine, Iowa.
PUB DATE	Mar 88
NOTE	36p.
PUB TYPE	Collected Works - Conference Proceedings (021)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Developed Nations; Developing Nations; *Development; Industrialization; International Organizations; Organizational Objectives; *Science and Society; *Scientific and Technical Information; Technological Advancement; Technology Transfer; World Problems
IDENTIFIERS	United Nations

ABSTRACT

Science and technology are helping solve problems around the world as well as creating new problems. The concentration of scientific and technological capabilities in a few countries exacerbates these new problems. The United Nations tried to address this disparity through a program on science and technology for development adopted in Vienna in 1979. That program has faltered. Participants at the Nations Issues Conference asked why, discussed the appropriate role for the United Nations, and identified new challenges. It was agreed that science, technology, and production interact in ways that often are unpredictable. Development was discussed as a society's ability to meet the needs of its people. The term endogenous capacity is used to describe a nation's ability to make informed choices and decisions about how to apply science and technology to economic and social development. Many felt the Vienna Programme of Action had failed because it was political in nature, it did not have sufficient input from the scientific and technological community, and it was unable to build its own constituency among member-nation governments, and therefore it lacked sufficient funds. Conference participants agreed there is no need for a grand scheme for promoting development. The role for the United Nations should be restricted to those areas where a universal, multilateral governmental agency is needed. There is also a role for multilateral organizations to facilitate coordination among efforts to apply science and technology to development. (JB)

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Science and Technology for Development

19th UN Issues Conference 1988

The Stanley Foundation

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Convened at
Arden House
Harriman, New York

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ISSN 0743-9180

Science and Technology for Development

Report of the Nineteenth United Nations Issues Conference

Sponsored by

The Stanley Foundation

February 26-28, 1988

Executive Summary

Science and technology are helping solve problems around the world as well as creating new problems. People are living longer due to improved health care, yet longer lives put new strains on the earth's resources. Industrialization stimulates economies yet produces by-products such as acid rain, air and water pollution, and other environmental dangers like the Chernobyl nuclear disaster or the Bhopal chemical accident. These do not recognize borders nor can they be addressed effectively by any one country or small group of countries.

These problems are exacerbated by the concentration of scientific and technological capabilities in a few countries. Even before the magnitude of these problems was realized, the United Nations tried to address the disparity in scientific and technological capacities through a program on science and technology for development adopted in Vienna in 1979. That program has faltered. Participants asked why, discussed the appropriate role for the United Nations, and identified new challenges.

Participants agreed that science, technology, and production interact in ways that are often unpredictable. At times science may lead to technology which produces some new product. At other times the need for some uninvented product may be the mother of science and technology. These two processes are often intertwined. However, the efficient application and integration of science and technology in a society are still largely unknown areas.

Development was discussed as a society's ability to meet the needs of its people. While those needs and the country's abilities are constantly changing, many see the potential of science and technology for speeding up this development process. Finding the proper tools to meet the specific needs of a society is a major concern. Individual countries need to seek input from many actors in government, business, science, technology, and finance, as well as from consumers in order to appraise their country's needs, resources, and priorities. The term *endogenous capacity* is used to describe a nation's ability to make informed choices and decisions about how to apply science and technology to economic and social development.

Many participants felt the Vienna Programme of Action had failed its goals: to bring science and technology into development through helping individual countries, to strengthen international scientific and technological relations, and to stimulate the United Nations' role in these endeavors. This was judged to be the case because the Vienna agreement was political in nature; it did not benefit from sufficient input from the scientific and technological community. Also, the UN program in science and technology for development was unable to build its own constituency among member-nation governments in the way other UN programs have and, as a result, lacked sufficient funds.

Participants agreed that there is no grand scheme for promoting development, nor is there a need for one. They also pointed out that the application or misapplication of science and technology to development is not taking place on the political front but rather through science and technology networks and transnational corporations. This is not to say that there is not a role for multilateral organizations.

The role for the United Nations should be restricted to those areas where a universal, multilateral governmental agency is needed. There is also a role for multilateral organizations to facilitate coordination among efforts to apply science and technology to development.

Specific tasks for the various organs created by the Vienna conference were suggested by some participants. The tasks included: facilitating the exchange of experiences between countries, providing for policy dialogues, supplying professional support for scientists and engineers in their countries, working with international professional nongovernmental organizations, measuring and assessing trends in science and technology for development, mobilizing public opinion, and bridging gaps between government, business and science, and technology communities.

Multilateral organizations are best suited for this role because of their ability to address the often global issues surrounding science and technology, the international implications of defending national interests, the world economy, and differing ethical and moral concerns. Multilaterals, especially the United Nations, also have the advantage of providing a neutral forum for discussion.

Finding where the United Nations has a comparative advantage in promoting science and technology is a continuing challenge. However, in the face of the global environmental and demographic changes taking place, the challenge cannot be ignored.

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Affiliations are listed for identification purposes only. Participants attended as individuals rather than as representatives of their governments or organizations.

Opening Remarks

Richard H. Stanley
President, The Stanley Foundation

We are approaching the tenth year following the 1979 United Nations Conference on Science and Technology for Development, held in Vienna. I hope that our deliberations will reflect on what has and has not happened in the intervening decade and will contribute to the ten-year review which is being prepared. More important, I hope that this conference will contribute toward an improved climate for development and toward ways in which science and technology and multilateral initiatives can contribute to this objective.

Need and Response

As we look back to the Vienna conference, it is obvious that a number of principles which were agreed upon there are still widely accepted. Economic development is a vital unmet need. Clearly, science and technology are important elements of any economy. Further, developing-country economies are disadvantaged in these areas. The vast majority of scientific and technological capability resides in the industrialized world. The Vienna Programme of Action adopted at that conference recognizes the need to address this disparity.

Yet little progress has been made in the past decade, and it may well be that we have regressed. In the 1987-88 edition of *World Military and Social Expenditures*, researcher Ruth Leger Sivard notes that while the world's Gross National Product has tripled since 1960, the gap in income between the richest and poorest nations has widened. The share of GNP held by the richest one-fifth of the world is 74 percent. By contrast, the poorest one-fifth hold barely 1.5 percent. Amazingly, the poorest three-fifths, or 60 percent, of the population holds just over 7 percent of the world's wealth.

Directly to the point of this conference, the efforts to implement the Vienna Programme have been underfunded and weak. Why this disparity between a recognized need and progress toward it? Why too little willingness to act to implement a generally supported Programme of Action? I think we can point to several factors.

First, we need to disprove the myths concerning science and technology. Too frequently they are perceived as some sort of a magic quick fix to development. Some of the rhetoric surrounding this issue suggests that it might somehow be possible for national leaders to acquire advanced scientific and technological capabilities, such as exist in the developed world, and immediately solve economic development problems. It seems to me that in some ways the Vienna conference bought into this aura of mystery and magic.

A part of this problem is the continuing persistence within our societies of what C. P. Snow and others have described as "two cultures," one scientific and technological and the other substantially illiterate on such matters. Not only do these two cultures persist, but communication between them is minimal and inadequate. One culture holds most of the knowledge of capabilities, limits, and applications of science and technology. The other most generally holds the positions that have to do with diplomacy, public policy, national strategy, and resource allocation. Scientists and engineers rarely understand political forces and problems any better than the politicians understand principles of physics. This gap must be bridged if the potential contribution of science and technology to development is to be realized.

While nearly everyone pays lip service to the role of science and technology in economic development, that role is not well understood. Science and technology are a part of the development process, but **only** a part. They are no more a solution for developing economies than any other one element. Further, the technologies that are most likely to be helpful to developing economies are engineering and applied sciences rather than basic and research sciences. The latest and most esoteric technologies seldom have significant economic impact until they develop into an applied technology; and whether and when they will do this is highly unpredictable.

A second important factor is that we need to recognize that science and technology already greatly limit the capability of every country to unilaterally control its economy and the knowledge and use of science and technology within its borders. Just a year

ago I attended a conference in Moscow and learned on my return that my next door neighbor had seen me on CNN which had been transmitted from Soviet television as I listened to a speech by General Secretary Gorbachev. The communications technologies that carry information almost instantaneously to all parts of the world have contributed to making the world highly interdependent and are continuing to make it more so. Today, there is essentially one world capital market. Flexible exchange rates quickly transmit the effect of key national tax, spending, and budget decisions from one country to another. The rise of transnationals and their ability to use and disseminate science and technology without regard to national boundaries is changing the development and economic problems we face. In short, this growing interdependence severely limits national sovereignty in many areas of economics and knowledge, probably including national control of science and technology.

Because of this, traditional national government measures are less effective than they were in the past. It is increasingly important that national development policies, including those which regulate science and technology, take account of increased interdependence and the free flow of information. Existing international institutions, by extension, also need re-thinking in light of changing realities.

A third element working against implementation of the Vienna Programme is lack of a clear and specific understanding of the meaning of "endogenous capacity." This concept was widely embraced at Vienna. The working definition which has been used — the ability to make reasonable decisions about scientific and technological matters — is broad enough to gain general acceptance, but it may not be sufficient if we think only in terms of national political leaders holding this capacity. Another facet of interdependence is that a country's ability to develop economically and to apply science and technology constructively lies increasingly in its ability to use information technology effectively and efficiently including its rapid absorption into the production processes. This requires much more than informed policymakers. Policymakers must also have an economic infrastructure and skilled managers and workers to be able to implement new technologies. This requires a strong and pervasive human resource able to use and apply technology. It requires that the "culture gap" between the technical and the policy cultures be bridged. In this context, is endogenous capacity anything more than having a generally better educated public? If so, what?

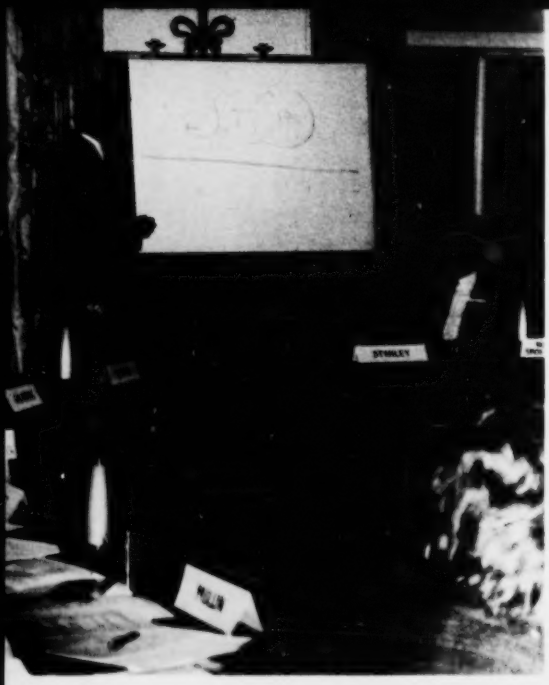
A fourth factor which has worked against implementation of

the Vienna Programme is the general world economic condition of the 1980s. The Vienna conference took place shortly before a massive global recession. This sapped the availability of funding for development and international programs. While much of the industrialized world is now seeing significant recovery from that recession, the recovery has not extended to much of the developing world. There are many reasons for this uneven recovery, but the scientific and technological gap has helped contribute to it while at the same time being perpetuated by it.

Finally, the past decade has been one in which disenchantment with public solutions to social problems has grown. The late 1960s and the 1970s were an era in which numerous international conferences were convened to address social problems of global proportions. This trend paralleled national policy climates which featured an aggressive public role in confronting social and economic disequilibrium. In many developing countries, central economic planning was an important element of national policy. However, the 1980s ushered in a new questioning of the efficacy of many social problems and of central economic planning. Development planning itself has become rather suspect. Notions of decentralizing decision making and letting market forces influence economic activity have gained favor. Economic efficiency has replaced social justice as the top priority for many.

In international organizations, this trend has featured an aggressive new questioning of the broad programs which were agreed to in earlier decades. We do not have to impugn the intent of those who adopted approaches such as the Vienna Programme to question the effectiveness of them. In many ways, the meeting at Vienna was typical of other international conferences of that era. Men and women of goodwill met to discuss a genuine problem — the disparity of scientific and technological capability between developed and developing countries. But while accepting the concept that something needed to be done, there were wide differences over how specifically to go about it. These differences were all but ignored in the adoption of a Programme of Action and the establishment of machinery in the form of committees and a small secretariat office. All too often in the 1970s, conference delegations departed after taking such action, believing that they really had done something to address the problem. But as the intervening years have shown us, the real political differences that were masked have gotten in the way of the implementation of concrete programs that really address the problem.

Together, these factors have yielded a climate that has not been conducive to implementation of the Vienna Programme. In the



Francisco Sagasti illustrates a point.

face of considerable disagreement about the need for UN programs in science and technology for development, funding has been hard to come by. As we look to the future, are there prospects for multilateral actions that really do enhance the sensible integration of science and technology into economic development planning?

Seeking a Middle Ground

It may be that prospects are brightened if there is, as some people have observed, a general trend toward political moderation within multilateral institutions. The United Nations has been hampered for the past ten to fifteen years or more by East-West and North-South confrontations.

Within the past year there has been warming of relationships between the United States and Soviet Union. More important for this issue, there has been cooling of the harsh rhetoric which has passed between developed and developing countries. Whether these trends will continue is still open to question.

Many developing-country leaders have questioned the intent of those in the industrialized world, doubting their desire to see genuine economic development in the South and more equitable distribution of the world's wealth. From the perspective of many in the developed world, the disagreement has been more over

means than ends. That is, they are concerned with what they perceive as ineffective state-centered approaches to economic development which they see as frequently favored over market-oriented economic approaches.

In the past several years, the rhetoric from many in the South has cooled somewhat. In addition, even some nations which have been historically suspicious of the free reign of market forces have moved to temper their restrictions on those forces. Admittedly, this has sometimes been done under duress. Nevertheless, the policy shifts amount to some moderation.

There is a need for corresponding moderation from the developed world. It must be acknowledged there that market forces are more concerned with production of wealth than with its distribution. Both within developing countries and on a global scale, distribution is an issue which cannot be ignored. Further, it must be acknowledged that even free-market economies require stable governments able to provide infrastructure and support services.

Beyond a generally more moderate political environment, prospects for better use of science and technology for development require a clearer understanding of their role in national economies and in the international realm. Further, there is need for better understanding of how sound development policies can foster increased endogenous capability and reasonable regulation of science and technology.

In short, economists, politicians, businesspeople, and others involved in the development process must stop looking at science and technology as ill-defined phenomena, the absence of which can be used as an excuse for poor performance. They must consider how to use science and technology skillfully. For their part, the scientific and technological communities must become more adept at articulating what they can and cannot offer to the development process, avoiding the pitfall of believing that science and technology take place in a political and social vacuum.

The Multilateral Role

Currently, the vast majority of scientists, engineers, and researchers work in universities, private institutes, and private enterprises that reside in the industrialized world. Most of the work they do is directed toward meeting the demands of the developed world. It has not been a high priority to develop products, processes, or services that are economically, culturally, or socially sensitive to the needs of developing countries. Yet those countries are in desperate need of such help.

The Vienna conference recognized this disparity and need. The Programme of Action set out goals for addressing it and created institutional machinery. However, concrete programs that effectively address the problem have been few and far between. Perhaps the most difficult task facing us this weekend is to attempt to identify concrete steps that can be taken within multilateral institutions to sensibly integrate science and technology into the development process.

The concept of endogenous capacity still seems valid insofar as it goes. But another part of coming to terms with this subject is the realization that science and technology are not forces which can be harnessed to yield a predictable outcome, nor can they easily be contained within borders. I believe multilateral efforts to improve the endogenous capacity in developing countries are necessary. But in order to design programs that lead to such a capacity, the target audiences must be identified and the persons involved need to see the importance of acquiring new knowledge in this area. Perhaps the more difficult task, however, lies in convincing those who have the scientific and technological wealth that they have an interest in encouraging greater capacity in developing countries.

Conclusion

Certainly a case based on self-interest can be made. That is, expanding economies in developing countries yield new economic opportunities in the developed world as well. However, the more compelling case, I believe, lies in defining self-interest and national interest more broadly in a way that recognizes and gives greater concern to the impact of decisions on others and on the broader world economy. This new definition must include the principle that there is a common responsibility for making national policy decisions that are both compatible with the international context and sensitive to domestic needs. It must recognize our common humanity.

There can be no long-term security, no stable business climate, no bright future in a world in which billions of people live in desperate poverty. Yet, such is the world today.

The framers of the United Nations Charter correctly recognized that gross inequity in economic development is a cause for political insecurity and the source of potentially devastating conflict. They made development a major goal of the organization. Science and technology can play important roles in advancing development. But until now, they have been more significant as still another barometer of inequality.

Science and technology for development focuses on one of the most urgent problems of the day. Our task of seeking an effective multilateral approach to this problem is an awesome responsibility.

Rapporteurs Anita DeKock and Jeff Martin

Science and Technology in Development: The Multilateral Role

Promoting development and narrowing the gap between the haves and have-nots of the world has always been a goal of the United Nations. The writers of the Charter saw this as essential to creating a more peaceful and just world. As the decolonization process increased membership in the organization in the 1960s and 1970s, development took on an even higher priority.

Economic development is complex and multifaceted, and the United Nations created separate programs dealing with many of its component parts. A number of these were created as the result of international conferences such as those on population, trade, food and agriculture policy, disarmament and development, and many others. Unfortunately, no one agency has been successful in integrating these development initiatives.

In 1979 the United Nations Conference on Science and Technology for Development was held in Vienna, and a program of action was adopted. This reflected the fact that science and technology are major factors in the world, that they will not go away, and that ignoring them is destructive; they must be used positively. The Vienna Programme called for: 1) strengthening the science and technology capacities of developing countries; 2) restructuring international scientific and technological relations; and 3) strengthening the role of the UN system in the field of science and technolgy for development. The conference established an intergovernmental committee consisting of all UN members to oversee pursuit of these objectives, a center within the UN secretariat to execute programs, a twenty-eight-member advisory committee to guide the work of the center and the intergovernmental committee, and a financing system to pay for this work. While most of the UN machinery was set up as planned, little progress

The rapporteurs prepared this report following the conference. It contains their interpretation of the proceedings and is not merely a descriptive, chronological account. Participants neither reviewed nor approved the report. Therefore, it should not be assumed that every participant subscribes to all recommendations, observations, and conclusions.

has been made toward the substantive goals set out at Vienna.

Participants at this Stanley Foundation conference discussed the reasons for the disappointing performance, reassessed the role of multilateral institutions in promoting science and technology for development, and identified opportunities and challenges for the future. The conference took place as preparations began for the end-of-decade review of the Vienna Programme.

The Problems

Participants considered the role of science and technology in society, the process of economic development, and the problems of trying to integrate them through the United Nations.

Science and Technology

It was quickly apparent that it is difficult, if not impossible, to accurately describe or define the role of science and technology in society or even their relationship to each other. A simplistic model describes a progression whereby science leads to technology which in turn leads to production of new products or processes. This linear approach seemed inadequate to describe the real-world situation in which much of science is devoted to explaining already-existing technology. Additionally the demand for a particular product or process may actually drive scientific research and technological development. Does new knowledge derived from scientific inquiry and the availability of technological capacity *push* the development of new products and processes, or rather is science and technology *pulled* by the demand for new products and processes? Participants agreed that the process works in both directions and that any model that did not provide for a multiplicity of interactions between science, technology, and production was largely inaccurate and useless. They concluded that science and technology are random, multivariable, and nonsequential; that is, the effect they will have on a society is not readily predictable.

Determining the impact of science and technology is further compounded by the fact that they are means to an end rather than ends in themselves. As a result it is often difficult to isolate their contribution. For example, if the application is in the field of agriculture, the specific scientific or technological contributions will be subsumed in what is seen as a purely agricultural advancement.

Science and technology, although often spoken of in tandem, are quite distinct and sometimes at odds. This further compounds the already-confusing task of identifying their roles.

Scientists engaged in pure research want to have their findings shared and publicized. Technologists, on the other hand, who develop applications for scientific findings may wish to limit accessibility to their discoveries for commercial reasons.

It is easy to fall into a trap of anthropomorphizing science and technology. Science and technology are seen as being forces by themselves which can be good or bad, capable or incapable of working great things in a particular country. Participants were quick to point out that science and technology by themselves do not cause anything. It is their application which is important. And determining how to integrate science and technology into national policy making in a productive way is still largely unknown. Participants noted that even the most developed countries have not been successful in doing this. Finding appropriate ways to apply science and technology for development is further compounded by differing societal attitudes toward change.

Western religious and societal mores see conditions such as hunger and disease as problems which society should attempt to solve. Moreover, applying science and technology to their solution is quite appropriate. This is not the case in all cultures. Some see hunger, disease, and poverty as all part of the natural cycle of life — immutable facts which one should not attempt to change.

In spite of the confusion about how science and technology relate to and impact on society, there is a widely held assumption that they could usefully help to bridge the ever-increasing gap between the developed and developing worlds.

Development

To a large extent, development defies definition. In some ways it is easier to describe it, to recognize where development exists, or more accurately, where it is lacking, than it is to define the process of development. In addition, it is all too easy to neatly divide the world into two large blocks — industrialized and developing — without considering the wide variety or levels in each group. Participants agreed on the need to disaggregate countries and often sectors within countries when speaking about development. Most could accept defining the term *development* as the way that society meets the growing needs of its people — needs which range from food and housing to intellectual stimulation and recreation, many of the things that it means to be human. Using this definition, no country will ever be completely developed because the problems facing its people continue to grow and change. It also makes it quite obvious that no one model for development will ever be acceptable. Each country's particular state

of development dictates its needs and its ability to address them. Where a country finds itself on this hierarchy of needs is largely what determines its status as developed or developing. Development then is not an end or a goal but rather a process.

All countries are part of this process. Obviously some are moving more quickly and in a more systematic way. Some so-called "primitive" societies rely almost exclusively on the traditional approach of trial and error in searching for knowledge, while modern society has institutionalized the search for ways to fulfill more, and an increasing range of, societal needs. This institutionalized inquiry is called science and technology.

Meanwhile, the push for economic development is intensifying. One impact of television and radio has been to shrink the size of the world while vastly increasing consumer demands in all parts of the world for those things which are seen or described. Thus the gap between where certain countries find themselves and where they would like to be widens and the demand for change — often rapid change — grows.

This then is the connection between science and technology and development. Are there ways to accelerate the development process so that more countries can advance on the hierarchy of needs? Many see science and technology as offering ways to do this. As one participant noted, what we are really trying to do in the developing countries is accomplish in one generation what took 200-300 years to accomplish in the industrialized world. In addition we want to do this without having to endure the very negative aspects of industrialization such as child labor and inhuman working conditions which the industrialized countries suffered through.

The challenge to the representatives at the Vienna conference was to meld these two poorly understood processes — the role of science and technology in society and economic and social development. National ability to make informed choices and to use science and technology constructively in the development process varies widely. *Endogenous capacity* is a term that was coined to describe that ability.

Participants offered a number of definitions or variations of definitions of endogenous capacity. To some it is the capacity of a country to help with its own development in a scientific way and to improve the quality of life. It includes the ability to make relatively independent decisions and goes beyond just the level of decisionmakers and scientists to include consumers. Many made note of the need for choices concerning development to be

Sessions were conducted in a roundtable format.

the result of a decision-making process that includes a wide variety of actors — people both in and out the policy-making circles of governments and the scientific and technological communities. More specifically, it is important that there be the scientific and technical component, the entrepreneurial component, both the private and public financial components, and government involvement. Decisions need to be based on the priorities, needs, circumstances, and resources of that particular country rather than being the choice of an outside institution or funding source. Endogenous capacity must include the step of actually making decisions because even the availability of the very best scientists and technologists would be of little use if their contributions could not be translated into decisions.

Many examples were cited of different countries reaching differing levels of competence in various industries. The levels range from simply being able to operate machinery in the plant; to running plant operations; to being able to redesign components of the process to fit differing needs; to being able, in the words of one participant, "to do everything for yourself that foreigners used to do." For some, a country has reached endogenous capacity only when it can do everything for itself. For others, endogenous capacity means achieving a certain measure of control over one's destiny and deciding, without undue outside pressure or influence, when outside help is wanted and when a country would rather do things by and for itself.

Institutional Limitations

It is not difficult to understand why the Vienna Programme of Action has met with only limited success. Two ill-defined components, science and technology and development, were brought together under an equally ill-defined heading of endogenous capacity. In defense of this approach it was noted that, in order to receive broad support, the definition of endogenous capacity had to be vague enough to let each country read into it what it will. Such an approach was appropriately termed "constructive ambiguity." A less positive reading might call this situation a lack of genuine consensus on the goals of the program.

The United Nations' efforts on science and technology for development have been hampered by a series of problems common to many programs in the United Nations. These include reduced commitment to multilateralism in some quarters and serious questioning of the applicability of intergovernmental solutions to development issues.

Governmental Limitations. The use of broad terms and blurred definitions in the Vienna Programme of Action made political agreement possible. However, it also masked disagreements that have hampered the translation of the program into meaningful activities.

That is one of the inherent limits of programs that are negotiated by government representatives – i.e., diplomats or political people. They are skilled in the art of compromise, but the lack of involvement by those in the private sector who hold the money or by scientists and technologists who know the field means the governments may have negotiated the establishment of a program with little or nothing behind it. One participant said this state-to-state negotiation of a document — the Vienna Programme of Action — was an "incestuous affair." It is cited by diplomats, he said, as if it were the Bible when in reality the program is ignored by most who know and operate in the field of science and technology.

The exercise of creating such a document also implies that multilateral efforts to integrate science and technology into the development process can be directed from the top down. It was suggested that the more productive approach to development planning is to look at the actual situation in a developing country and then have those directly involved try to decide whether or how science and technology could help. After that, it is appropriate to evaluate what the multilateral role in providing the assistance might be.

There was consensus that the best that politicians can do is set out principles, or socially desirable goals, such as those articulated in the Vienna Programme. It must be left to specialists to conduct scientific, technological, and entrepreneurial activities directed toward those goals.

Bureaucratic Jealousies. Science and technology for development has also been harmed by another problem common to the United Nations system — the existence of fiefdoms. Departments, programs, and specialized agencies all compete with each other. This is compounded by the fact that each has its own constituency within member-nation governments. For example, agriculture ministries relate to the Food and Agriculture Organization and education ministries to UNESCO. Many of those agencies have their own science and technology programs. The United Nations' program in science and technology for development suffers in this situation on two counts. First, those in national ministries who have an allegiance to another specialized agency's program see this program as a rival. Second, this program does not have its own engaged constituency within member governments to defend it.

Insufficient Funds. The financing system which the Vienna Programme established has never been funded as envisioned. For the most part, the major funding nations have not contributed. Whether this is a cause of the failure of the program or an effect stemming from perceived inefficacy is debatable. Many argue that it is some of both.

Certainly, the program fell victim in the 1980s to greatly increased questioning of the value of multilateral programs. Furthermore, it was argued that North-South cooperation in this decade has been extremely poor. However, some contend that the funding failure resulted from a belief that the program was poorly conceived and ill-defined from the outset.

Regardless, failure begets failure. Those who adopted the Vienna Programme expected that the Intergovernmental Committee (IGC) would draw high-level representation from governments because of its important mission. However, when the program was not financed, governments lost interest in sending high-level representatives. Today, the work of the IGC has fallen into such disregard that even some who originally argued for its establishment believe it could be abolished with no loss. Others, however, still think it has an important function and could be made more effective.

Approaching the Problem

The disparity between developed and developing countries is growing faster than ever. In the words of one participant, "... the technological revolution is leaving developing countries in the dust — even the natural resources comparative advantage is already diminishing." Such a pessimistic appraisal together with the myriad of problems associated with multilateral approaches previously outlined might lead one to believe that little or nothing is happening. That is not entirely accurate.

Multiple Activities

Participants were reluctant to accept any assumption that attention to development issues in general or the role of science and technology for development more specifically is declining. They were quick to point out that there is not now, nor should there ever be, one grand scheme for addressing the problem of promoting development. One participant cited the inevitable tendency to look for clear, dramatic solutions. In this area there is no single solution. In his words, "There are thousands of things that could be done. In fact, the situation is so crowded with diverse activity that it is extremely difficult to describe it."

There was a sense among participants that attention — in the form of dollars spent — to science and technology is not declining. Yet they agreed that there is little hard data to support this assumption. Few statistics are kept on what is spent for research and development. What is most clear is that most science and technology resource transfers are not happening through political channels (the United Nations) where they might be more noticeable but rather are moving through scientific and technical networks and through transnational corporations (TNCs).

TNCs hold promise for development if properly applied. They are able to facilitate a transfer of skills to the employed labor force, stimulate local technological innovation (although little is happening in the area), and could provide for a diffusion of technology through the economy (some progress is being made in this area). Sustaining such relationships and relationships between foreign and domestic enterprises may prove to be a key for encouraging development provided the relationships are constructive and nonexploitive.

Other channels mentioned for resource transfers in the area of science and technology for development included bilateral exchanges which countries often prefer because they are simpler to set up, easier to control, and often seem to have more benefit for each side. Other actors include UN specialized agencies, bilateral

Discussions provide food for thought.

development agencies, development banks, private foundations, and of course the United Nations.

The fact that there is no real coordination among all these activities and agencies is a source of great consternation for some who would like to be able to divide the efforts by agency, organization, or approach. Others recognized that given the ephemeral nature of development that there is room for many and varied approaches. Participants also pointed out that it would be a mistake to consider some sources or approaches superior to others. It truly depends on each country's situation. What works one place may fail in another. Each situation must receive individual attention.

Participants reiterated the need for countries to devise a process which incorporates input from a variety of participants (government, business, funding sources, scientists, technologists, and consumers) to determine a country's needs, resources, and priorities. After such an appraisal a country would be in a much better position to determine what kind of assistance it needs and the most appropriate source for that assistance.

The Multilateral Role

Most participants said there are good reasons for multilateral initiatives in elevating the level of science and technology for development. Appropriately used, multilateral institutions can make a unique contribution. The key lies in finding where those institutions have a comparative advantage over bilateral gov-

ernmental or private sector initiatives.

There are political and economic reasons for multilateral approaches. Some issues, such as the environment and AIDS are truly global. In addition, national policies almost always have an international dimension; that is, they affect or are affected by the international situation. Policies may be influenced by the international situation, the need to defend national interests, or the desire to create a context favorable for national initiatives. Finally, multilateral approaches can respond to some of the transnational characteristics of the world economy. These include the internationalization of production, the global nature of finance, and the problems and opportunities arising from direct foreign investment.

Ethical and moral concerns may also be addressed through multilateralism. It should be a function of the international community to address disparities of wealth between and within countries by pushing for a standard of equal opportunity. Protection of the weakest countries from severe exploitation should be a minimum standard.

Multilateral approaches, it was argued by many, are uniquely suited to these political, economic, and moral concerns. They involve multiple interests and constituencies with a diversity of perspectives. Negotiations and the compromises reached through them are broad-based and thus stand a better chance of gaining widespread political support. Multilateral institutions can also make a contribution by providing a neutral forum where experts from all over the world can discuss issues and seek common solutions.

However, in the field of science and technology for development it is essential that the gap between the **potential** of multilateral approaches and their **actual performance** be greatly narrowed. Focus should be on increasing international cooperation and on support of effective actions to integrate science and technology into the development process at the national level. For this to happen, the process must involve the real actors engaged in generating and using science and technology. This includes scientists and engineers as well as the transnational corporations, private firms, and enterprises which produce goods and services developed by the scientific/technological community. One participant suggested that an initial step might be to mobilize financial resources for a few initiatives chosen for their impact and visibility.

In all cases, when multilateral options are considered, questions

Participants came from governmental and nongovernmental backgrounds.

of comparative advantage must be taken into account. What does a multilateral approach offer to offset the advantages of bilateralism? When a multilateral option is selected, which institution is best suited to the task? A specialized agency? A limited membership regional organization? A development bank?

When considering what role the United Nations proper is to play in science and technology for development, the relevant question, it was suggested, is: "What can best be done by a universal, multilateral, governmental organization?" In general, it was suggested that the United Nations can be the forum for the exchange of views between different actors. This needs to involve much more than government representatives.

A number of tasks were suggested for the various organs created by the Vienna conference. They are assigned to a specific organ here even though some of the tasks may fall to more than one.

United Nations Centre for Science and Technology for Development:

- provide a coordinating and catalytic role in articulating exchanges of experiences between countries.
- organize and support policy dialogues and provide policy advice that helps integrate science and technology into national development planning. In this regard, it was noted that the Centre has organized a number of national policy dialogues involving scientists, engineers, development planners, entre-

preneurs, etc., within countries.
- provide professional support for scientists and engineers in their countries. This could include dialogue with national governments to help them understand the value of the highly trained people in their populations and the need to provide incentives for them to stay in their home countries. (It was noted that many university-trained scientists and engineers in developing countries drive taxicabs because there are no jobs for them.) It also involves helping them exchange information and assistance in gaining access to technical journals.
- foster a liaison between professional nongovernmental organizations which have international programs and governments.
- be the analytical body, the "brain" which measures and assesses trends and developments in science and technology for development.

Advisory Committee on Science and Technology for Development (ACSTD)
- mobilize public opinion and provide intellectual leadership for the UN programs.
- help bridge the gap between governments, the science and technology communities, and those responsible for productive enterprises. The composition of this twenty-eight-member body suits it to this task because it is made up of scientists, engineers, development experts, and private sector representatives.

Intergovernmental Committee
- assist in developing broad public support for the importance of science and technology for development. Some members of the group believed that, given this body's current membership, it is no longer suited to this task and could probably be eliminated. These people thought the issues discussed in this committee could be covered by ECOSOC.

New Challenges

A number of participants said that a series of phenomena that fall under the rubric of "global change" may compel world leaders to see their common interest in addressing the need for increased scientific and technological capability in the developing countries. For the most part these changes involve demographics and the environment.

One thesis is that technology is helping to alter the demographic composition of the world in such a way that the world in fifty to one hundred years will be significantly different. Improved health care, for example, is causing people to live longer, creating

new demands for services and placing new strains on the earth's resources (not to mention the impact of creating expectations for greater longevity). Great differences in birthrates are changing the location of population concentrations, affecting where the resource strains are most profound. That, in turn, has consequences for international relations.

Recognition of this type of change is quite recent. The full consequences are not known nor has there been a great deal of research. Participants said that it is apparent that research along these lines cannot be limited to scientists and technologists in industrialized countries. The problems are truly global in proportion and require scientific and technological solutions appropriate to all parts of the world.

Another change is the growing demand for new approaches to development that do not pose as great a threat to the environment. This springs from a recognition that degradation of the physical environment cannot be contained within national borders. Acid rain, depletion of the ozone layer, nuclear disasters like Chernobyl, chemical accidents such as Bhopal, and the pollution of the Rhine River are all examples of environmental hazards that have consequences across borders. There is a scientific and technological challenge in devising ways to help Third World countries grow economically with fewer threats to the environment and in ways that do not use up valuable and irreplaceable resources.

Coping with these changes is clearly beyond the means of any one country or even a small group of countries. It is also beyond the grasp of individually operating scientists, engineers, and entrepreneurs. Participants said an approach to research that integrates numerous disciplines as well as researchers from many countries is essential to addressing this challenge. Furthermore, it was argued, the research must go beyond the natural sciences to encompass the social sciences in coping with the human response to global change.

This new level of problems for managing the globe calls for a changed international dialogue, the participants said. That dialogue must involve more than government representatives, since, in the words of one participant, "Governments are only modifiers of what is happening in the scientific and economic world." This will be a real test of the UN system, and it must show that it can respond. Some participants said that human survival is at stake here, and one suggested that at some point it may be necessary for the UN Security Council to focus its attention in

Informal conversations during breaks.

this direction. While all agreed on the seriousness of the situation, some cautioned that discussion of multilateral approaches should not go so far as to suggest the need for supranational authority since that would undermine national support for the programs.

The global nature of these changes calls attention to the common need for countries at all stages of development to work together to address them. If that need is recognized, one participant said, it may be that efforts to help developing countries enhance their scientific and technological capacities will be taken out of the category of "foreign aid."

Conclusion

In many respects, the UN program on science and technology for development is typical of any number of UN development programs established in the late 1960s and the 1970s. The convening of an international conference and the creation of UN machinery helped to foster the illusion that a grand scheme can be devised to address these problems and that creation of a UN program of ac-

tion is the beginning of the implementation of that scheme. A series of actions, events, and policy shifts in the 1980s combined to shatter the illusion.

The participants at this meeting recognized the desperate need for improved scientific and technological capacity in developing countries. Yet they are inclined to a more modest and pragmatic approach as it relates to multilateral institutions. The key test that they applied is "comparative advantage." That is, multilateral solutions should be sought where they offer a genuine advantage over other approaches. For the organs that were set up by the Vienna conference, this might mean a more limited, though important, role.

It appears that the greatest challenge and opportunity for multilateral institutions in science and technology lies in coping with global change that defies strictly national or private approaches to management. The creative efforts of many people are required to make international organizations responsive to this challenge.

Chairman's Observations

Science and technology for development was a good conference topic for two reasons. First, the subject is important in itself. As our participants made clear, the application of science and technology, while not generally well understood, is a vital part of social and economic development, and there is strong argument for a multilateral role in promoting their effective and fair use.

The second reason is broader. The United Nations' program on science and technology, it seems to me, is typical of many other UN economic and social programs and exhibits many of the problems which need to be addressed in strengthening the United Nations in the short term and long term. This program was created with a burst of enthusiasm at an international conference, but the follow-up performance has been disappointing at best. In discussing this topic, the participants articulated a number of themes which can be broadened to apply to our thinking about international organizations more generally.

1. The overwhelming majority of economic and commercial activity is done through the private sector. While governments can regulate business and certainly can affect the business climate, the internationalization of the world economy severely limits the extent to which economic forces can be controlled by governments.

2. Most of the world's increasing social interdependence is a matter of private activity as well. In addition to business and commercial activity, the prominence of nongovernmental organizations (NGOs) is frequently underestimated. International professional, scientific, technical, and cultural associations abound. Countless interest groups are concerned about everything from population to the environment to the rule of law and much, much more. Electronic communications and computer-based information systems bridge national boundaries and build global awareness.

3. The most useful roles for governments are to provide a secure and stable climate conducive to these diverse activities, to advance agreed-upon social objectives, and to limit the exploitation of the disadvantaged. By coming together in intergovernmental organizations, nations have implied that they want to act cooperatively to accomplish those ends on an international scale.

4. In many respects, intergovernmental institutions like the

United Nations are losing the struggle to perform their tasks. The participants here and elsewhere have suggested that perhaps these institutions have not adjusted to the rapid changes brought about by globalization of the private economic and social sectors. Perhaps these institutions are acting in the context of a world that no longer exists.

In applying these observations to the notion of reform of the United Nations both in the short term and long term, some lessons can be learned. In the short term, intergovernmental institutions need to be sure they maintain a focus on ends and evaluate means accordingly. In considering programs, they need to apply the standard of comparative advantage, as our participants here suggested. This might mean greater reliance on and involvement with private activity. It might mean more modest programmatic activity than was first envisioned when a new work area was begun. Programs should be eliminated if there is no clear and advantageous role for an intergovernmental unit.

Longer term, however, there is a real need to rethink our rusty international political institutions. In science and technology for development and in many other fields, neither the current intergovernmental organizations, nor ad hoc networks of NGO's, nor profit-motivated enterprises are ideally suited to meeting the challenges posed by today's global changes. The increasing social and economic interdependence of our world requires a well thought out public response. Our current world political institutions are poorly equipped to provide that response. We need organizations that are better able to do preparatory research, to provide a forum for high-level dialogue, and to build genuine consensus. Moving toward such rejuvenated institutions should be a high priority for the world community.

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UN-Related Publications

The United Nations and the Future of Internationalism, Report of the Twenty-second United Nations of the Next Decade Conference. June 1987, 32 pp.

Administrative and Budgetary Reform of the United Nations, Report of the Eighteenth United Nations Issues Conference. February 1987, 28 pp.

The United Nations: Mission and Management, Report of the Twenty-first United Nations of the Next Decade Conference. June 1986, 32 pp.

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